I claim:

1. A process for retrofit of a unit for sulfur recovery from one or more process gases comprising greater than about one mole percent H2S where such process gas is or process gases are derived from an effluent of one or more thermal stages processing an acid gas feed comprising H2S where a burner for the thermal stages are adapted to burn an oxygen containing gas at less than or equal to about 28 mole percent oxygen, the improvement comprising:

(a) one or more mid-location catalytic stages acting sequentially on the effluent of a last thermal to form a process gas from each sequential mid-location catalytic stage, whereby the process gas from a last mid-location catalytic stage forms a tail gas;

(b) causing one or more of the mid-location catalytic stages to comprise selective oxidation catalyst; and

(c) reacting a feed gas to the one or more mid-location catalytic stages comprising selective oxidation catalyst with oxygen wherein H2S is converted to elemental sulfur.

2. A process for retrofit of a unit for sulfur recovery from one or more process gases comprising greater than about one mole percent H2S where such process gas is or process gases are derived from an effluent of one or more thermal stages processing an acid gas feed comprising H2S where a burner for the thermal stages are adapted to burn an oxygen containing gas at less than or equal to 100 mole percent oxygen, the improvement comprising:

(a) one or more mid-location catalytic stages acting sequentially on the effluent of a last thermal to form a process gas from each sequential mid-location catalytic stage, whereby the process gas from a last mid-location catalytic stage forms a tail gas;

(b) causing one or more of the mid-location catalytic stages to comprise selective oxidation catalyst; and

(c) reacting a feed gas to the one or more mid-location catalytic stages comprising selective oxidation catalyst with oxygen wherein H2S is converted to elemental sulfur.

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3. A process for sulfur recovery from one or more process gases comprising greater than about one mole percent H2S where such process gas is or process gases are derived from an effluent of one or more thermal or oxidation stages processing an acid gas feed comprising H2S, the improvement comprising:

(a) one or more mid-location catalytic stages acting sequentially on the effluent of a last thermal or oxidation stage to form a process gas from each sequential mid-location catalytic stage, whereby the process gas from a last mid-location catalytic stage forms a tail gas;

(b) one or more of the mid-location catalytic stages comprising selective oxidation catalyst; and

(c) reacting a feed gas with oxygen in the one or more mid-location catalytic stages comprising selective oxidation catalyst wherein H2S is converted to elemental sulfur.

4. The process of claim 3 wherein the tail gas comprises 10 mole percent or less non-elemental sulfur components.

5. The process of claim 4 wherein the tail gas comprises 5 mole percent or less non-elemental sulfur components.

6. The process of claim 5 wherein the tail gas comprises 2 mole percent or less non-elemental sulfur components.

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~~7. The process of claim 3 wherein the degree of H2S conversion to elemental sulfur in step (c) is controlled by limiting the amount of oxygen compared to H2S.~~

8. The process of claim 7 wherein the process comprises a method of retrofitting an existing sulfur recovery unit where one or more the mid-location catalytic stages are adapted to comprise selective oxidation catalyst such that the effluent from the bed of selective oxidation catalyst is permitted to attain a temperature of less than acceptable temperature limits for a pressure vessel in the mid-location catalytic stage containing the bed of selective oxidation catalyst.

9. The process of claim 3 wherein the mid-location catalytic stages comprise sequentially heating means, one or more immediately sequential catalyst beds and a separator / condenser.

10. The process of claim 3 wherein a first catalytic stage receives the effluent from the last thermal or oxidation stage, the first catalytic stage has a single catalyst bed containing only selective oxidation catalyst and in the first catalytic stage or upstream of the first catalytic stage an oxygen containing gas is mixed with the effluent from the thermal or oxidation stage to provide oxygen for a selective oxidation reaction.

11. The process of claim 3 wherein one or more of the mid-location catalytic stages comprising selective oxidation catalyst further comprise two or more adiabatically sequential catalyst beds, at least one of the sequential catalyst beds containing selective oxidation.

12. The process of claim 3 wherein a first catalytic stage receives the effluent from the last thermal or oxidation stage, a second catalytic stage receives the effluent from the first catalytic stage, the first and second catalytic stages each have a single catalyst bed containing only selective oxidation catalyst and in the first and second catalytic stage or upstream of the first and second catalytic stages an oxygen containing gas is mixed with the effluent from the thermal or oxidation stage and the first catalytic stage to provide oxygen for a selective oxidation reaction.

13. The process of claim 12 wherein a third catalytic stage receives effluent from the second catalytic stage and has a single catalyst bed containing only Claus reaction catalyst.

14. The process of claim 13 wherein a tail gas stage receives effluent from the third catalytic stage and produces an effluent with less than one mole percent non-elemental sulfur components.

15. The process of claim 3 wherein one or more of the catalytic stages of step (b) comprise an other catalytic bed containing only Claus reaction catalyst, hydrogenation catalyst or SO2 reduction catalyst.

16. The process of claim 15 wherein the other catalytic bed receives the effluent of the selective oxidation catalytic bed.

17. The process of claim 15 wherein the selective oxidation catalytic bed receives the effluent of the other catalytic bed.

18. The process of claim 17 wherein the gas stream fed to the catalytic stage further comprises a reduction gas of hydrogen, carbon monoxide or H2S.

19. The process of claim 3 wherein one or more of the mid-location catalytic stages comprising selective oxidation catalyst further comprise a catalyst bed containing a mixture of two or more catalysts, at least one of the catalysts being selective oxidation catalysts.

20. The process of claim 3 wherein, as compared with a unit for sulfur recovery having a sequence of a thermal stage, cooling and separation steps and one or more catalytic stages using only Claus reaction catalyst, a capacity increase is realized from use of the process of from about 25 percent to about 100 percent.

21. A process for retrofit of a unit for sulfur recovery from one or more process gases comprising greater than about one mole percent H2S where such process gas is or process gases are derived from an effluent of one or more thermal stages processing an acid gas feed comprising H2S where a burner for the thermal stages are adapted to burn an oxygen containing gas at less than or equal to about 28 mole percent oxygen, the improvement comprising:

(a) one or more mid-location catalytic stages acting sequentially on the effluent of a last thermal to form a process gas from each sequential mid-location catalytic stage, whereby the process gas from a last mid-location catalytic stage forms a tail gas;

(b) causing one or more of the mid-location catalytic stages to comprise selective oxidation catalyst;

(c) reacting a feed gas to the one or more mid-location catalytic stages comprising selective oxidation catalyst with oxygen wherein H2S is converted to elemental sulfur; and

(d) capacity expansion from an original design capacity for the unit for sulfur recovery is about from 25 percent to about 45 percent.

22. A process for retrofit of a unit for sulfur recovery from one or more process gases comprising greater than about one mole percent H2S where such process gas is or process gases are derived from an effluent of one or more thermal stages processing an

acid gas feed comprising H2S where a burner for the thermal stages are adapted to burn an oxygen containing gas at less than or equal to 100 mole percent oxygen, the improvement comprising:

(a) one or more mid-location catalytic stages acting sequentially on the effluent of a last thermal to form a process gas from each sequential mid-location catalytic stage, whereby the process gas from a last mid-location catalytic stage forms a tail gas;

(b) causing one or more of the mid-location catalytic stages to comprise selective oxidation catalyst; and

(c) reacting a feed gas to the one or more mid-location catalytic stages comprising selective oxidation catalyst with oxygen wherein H2S is converted to elemental sulfur; and

(d) capacity expansion from an original design capacity for the unit for sulfur recovery is about from 70 percent to about 100 percent.

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